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1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE April 1993		3. REPORT TYPE AND DATES COVERED professional paper	
4. TITLE AND SUBTITLE ASW TACTICAL DECISION AIDING ISSUES: LESSONS LEARNED FROM USER'S FEEDBACK				5. FUNDING NUMBERS PR: CC58 PE: 0603708N WU: DN302013	
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Command, Control and Ocean Surveillance Center (NCCOSC) RDT&E Division San Diego, CA 92152-5001					
8. PERFORMING ORGANIZATION REPORT NUMBER				10. SPONSORING/MONITORING AGENCY REPORT NUMBER 93-23054 	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Naval Sea Systems Command PEO/USW Washington, DC 20362					
11. SUPPLEMENTARY NOTES					
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.					
13. ABSTRACT (Maximum 200 words) <p>This paper addresses a number of significant issues associated with Anti-Submarine Warfare (ASW) tactical decision aids based on lessons learned from user's feedback. In particular, feedback from users of the ASW Tactical Decision Aid (ASWTDA) or potential users (those who have been given a demonstration of its functionality) is considered from the point-of-view of lessons learned to benefit prospective users of subsequent ASW tactical decision aid software applications which better satisfy requirements of users. A distinction is clearly made between the existing capability for decision support applications and the emerging requirements about computer-based assessment, computer-derived recommended decisions and computer-generated displays, which contain recommendations.</p> <p>This paper focuses on evolutionary development for available technology and software engineering with respect to the direction in the future of ASW tactical decision aids. Lessons learned are derived from operational experience of fleet users and their need to have easy-to-use and easy-to-understand tactical decision aids which support their ASW decision-making process. Rapid prototype methodology is endorsed as combined with a structured process for measuring its effectiveness and improving the overall process. A generalized approach has been taken to facilitate the wider range of audience and need to conceptualize beyond current ASW tactical decision functionality which exist in the U.S. Navy today. These issues are addressed but not resolved by existing applications of computer-based methods for ASW tactical decision aiding.</p> <p>The accompanying presentation for this paper summarizes each significant issue and provides selected illustrations from ASWTDA to show existing capability versus emerging requirements for next generation of ASW tactical decision aid software applications. It is the intent of the author to stimulate and motivate development agents to be more sensitive to user's feedback/lessons learned so that future ASW tactical decision aid software products add value to naval users' needs for computer-based assessments, recommended tactical decision alternatives and computer-generated displays to enhance their decision making about allocation of their resources against actual threat or potential threat submarines.</p> <p>Published in Proceedings, 9th Annual Conference on Command and Control Decision Aids, 1992, Section B1.</p>					
14. SUBJECT TERMS C2FORASW				15. NUMBER OF PAGES 93 10 1 159	
				16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT UNCLASSIFIED		18. SECURITY CLASSIFICATION OF THIS PAGE UNCLASSIFIED		19. SECURITY CLASSIFICATION OF ABSTRACT UNCLASSIFIED	
				20. LIMITATION OF ABSTRACT SAME AS REPORT	

UNCLASSIFIED

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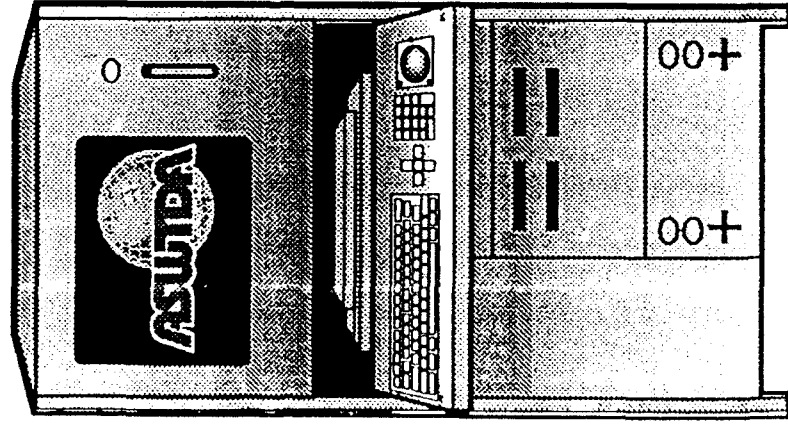
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ASW Tactical Decision Aiding Issues

Lessons Learned from User's Feedback



Presented to:

9th Annual Conference on
**Command and Control
Decision Aids**

Presented by:

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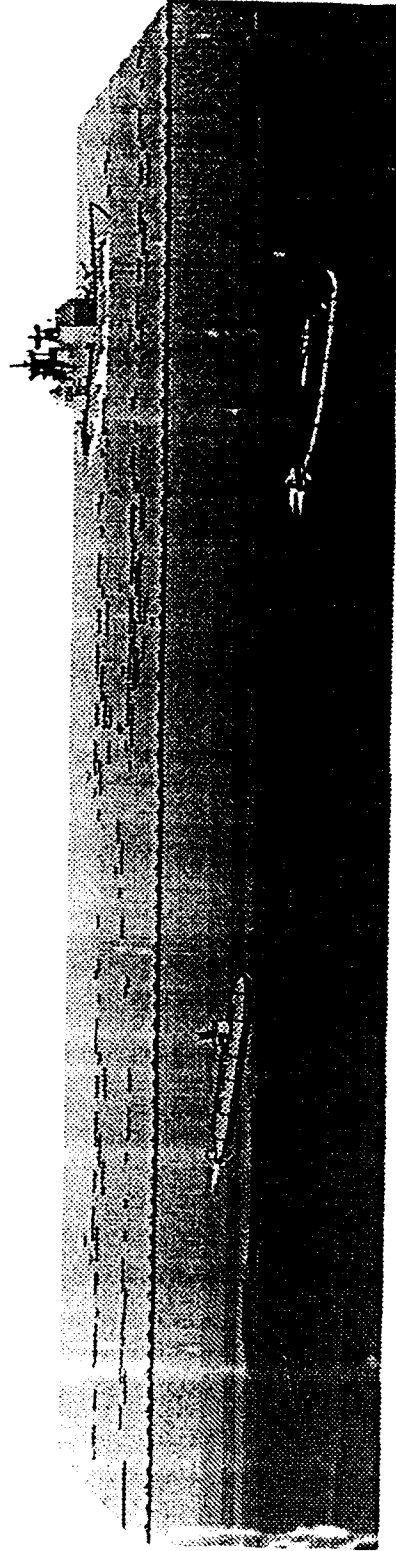
Outline for Presentation of Topics

- Introduction and Some Background
- Sources for ASWTDA User Feedback
- DTC-1 Prototypes/Lessons Learned
- DTC-2 Prototypes/Lessons Learned
- Significant Issues and Resolutions
- Conclusion and Future Challenges



Introduction and Some Background

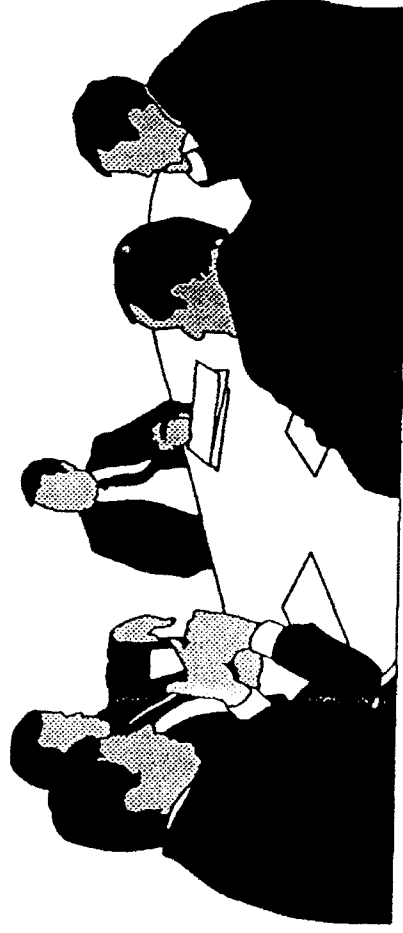
- ASW Tactical Decision Aids
 - Afloat
 - Ashore
- Some Background for ASWTDA
 - OPNAV Directed
 - Rapid Prototype
 - APP Program Product
 - ASWC/CO Oriented
 - JOTS Application





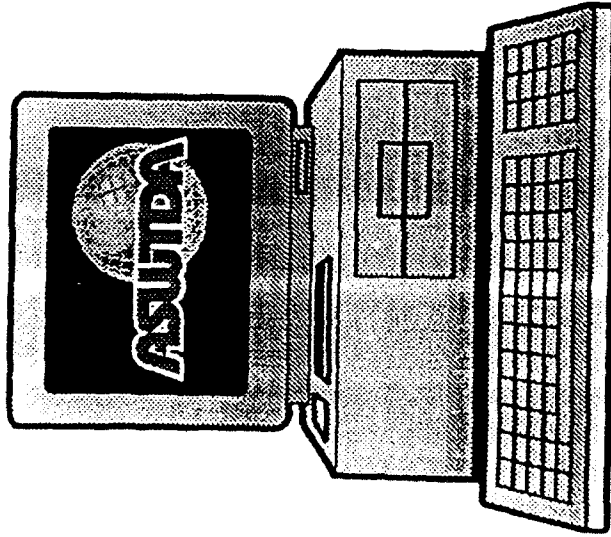
Sources of ASWTD User Feedback

- Feedback from DTC-1 Prototypes
- Feedback from DTC-2 Prototypes
- Fleet ASW Operations/Exercises
- DTC-2 Prototypes/Lessons Learned
- Site Observations
- Briefings/Demos
- Evaluation Reports





DTC-1 Prototype Sites

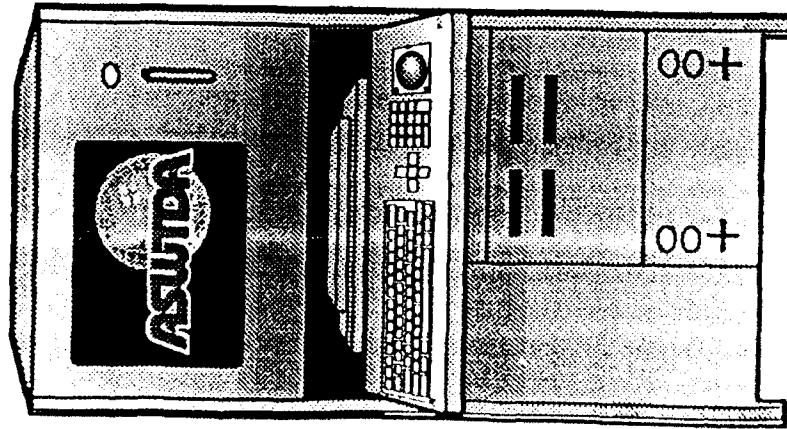


DTC-1
(HP 9020)

- CDS 31 (USS Cushing/USS Fletcher)
- CDS 24 (USS Spruance/USS Saratoga)
- CDS 21 (USS Nimitz)
- CDS 9 (USS Abraham Lincoln)
- ASWOC (NAS Bermuda)
- CTF 12 (CINCPACFLT)
- CTF 66 (COMSIXTHFLT)



DTC-2 Prototype Sites



DTC-2
(SUN 4)

- NCCS (Ashore)
- NTCS (Afloat)
- CTF 12 (CINCPACFLT)
- CTF 66 (COMSIXTHFLT)
- CDS 31 (USS Cushing/USS Fletcher)
- CDS 7 (USS Ranger)
- SURFWARDEVGRU



Issue

ASW tactical decision aids need to provide *easily understood tactical recommendations* which improve decision-making process with clearly depicted graphics displays.



Resolution

ASW tactical decision aids add real value when information is processed or output in an *easily understood graphics display*, which is not left to the discretion of the user to determine its information content.



Issue

Complex procedures for analysis of the ASW environment need *restructuring, streamlining and simplification* to be tactically useful via computer-aided assessment techniques.



2. Resolution

Computer-assisted environmental assessment will reduce *manning requirements* and add benefit for ASW tactical decision aids by minimizing a need for full-time or analytical support.



Issue

Procedures to assess ASW tactical situations need to assure the *quality of information* in terms of accuracy, completeness, timeliness, and improvements to decision-making process



3 Resolution

Future ASW tactical decision aids need to add *quality assurance functions* that continually check the quality of incoming, processed and outputted information in assessing situations.



4: Issue

Recommendations for allocation of available ASW resources to be used in search planning need to clearly depict "*what if*" options as well as identify the best selected plan.



4: Resolution

ASW tactical decision aids have to provide a *tactically useful* search plan for assets as availability/selected by a decision-maker, who can verify its validity for situation.



5: Issue

Checklists of actions done/need to be done will *simplify complexity* with ASW tactical decision aids and enhance user performance of complex tasks by means of audit trails.



5. Resolution

Maximum usage of *computer-aided* techniques for simplifying a complex series of steps will enhance user performance of functions that might not be done if too complicated



Issue

Computer-based training with interactive *on-line tutorials* encourage users at all levels of ASW tactical decision aids to learn tasks and to gain proficiency.



Resolution

The development of computer-based training with interactive *on-line tutorials* focused on personnel qualification standards will improve use of ASW tactical decision aids.



7: Issue

On-line assistance for help/info about ASW tactical decision functions, the software, and references with additional information will contribute to learning/qualification.



7: Resolution

Expansion of computer-based on-line help for providing all the needed information to *assist users* of ASW tactical decision aids will improve learning/qualification



8: Issue

ASW tactical decision-aid users need to see and make *side-by-side comparisons* of output and displays as part of the decision making process in evaluating and selecting options



8: Resolution

Extension of today's software engineering technology to allow the users of decision aids in the windowing environment to make user-selectable side-by-side comparisons



9: Issue

A single desktop computer workstation will not support all ASW tactical decision aids and their usage by the ASWC and Commanding Officer of an ASW ship.



9: Resolution

Support for *additional workstations* for ASW tactical decision aids and pursue software engineering alternatives to have better usage of available workstations.



10: Issue

Time-sharing among multiple ASW tactical decision aids will not enhance their use or lead to acceptable performance during multi-warfare planning considerations.



10: Resolution

Investigate other *technical options* to minimize impact and consequences for a user having to time-share ASW tactical decision aids in a single workstation



11: Issue

ASW tactical decision aid users may become confused with *duplicative functions* (same function/different application) if outputs are not the same for unexplained reasons



11 Resolution

The *technical community* responsible for ASW tactical decision aid developments, tests, and evaluations needs to resolve these duplicative functionality issues.



12: Issue

ASW tactical decision aids may be of more value to decision-makers under *stressful conditions* than decision support applications because of the need for timely tactical recommendations.



12: Resolution

The *future direction* for ASW decision aids remains in the area of developing tactical recommendations that will be useful to ASW decision-makers under stressful conditions.



Conclusions and Future Challenges

- Success for today's and tomorrow's decision aids will rest with the users and others' willingness to include them in the overall process of:
 - Development
 - Test
 - Evaluation
 - Implementation
- The future challenges with ASW tactical decision aiding will be more automated inputting, processing, and outputting of tactical recommendations:
 - ASW Environmental Assessments
 - ASW Situational Assessments
 - Best Allocation of Resources
 - Implementation in C⁴I Systems



References

- System Specification for the Anti-Submarine Warfare Tactical Decision Aid (ASWTD A)*, Naval Ocean Systems Center, 30 September 1989
- Anti-Submarine Warfare Tactical Decision Aid (ASWTD A) Baseline Evaluation Report (DTC-1 Versions to 1.08E)*, (DRAFT FOR REVIEW), Michael T. Davis, LT, USN, Naval Ocean Systems Center, 30 September 1989
- A Human-Computer Interface Design Checklist for Military Computer Systems*, James I. Godley, LCDR, USN, Naval Post Graduate School, March 1991
- Government Off-The-Shelf (GOTS) Style Guide, Version 1.1*, SPAWAR, 30 September 1991
- User Interface Specifications for Navy Command and Control Systems, Version 1.0*, Kathleen Fernandes, Ph.D., NRAD, February 1992
- JOTS II, Version 1.1 User's Guide*, SPAWAR, 1 February 1992
- System Specification for the Anti-Submarine Warfare Tactical Decision Aid (ASWTD A), Revision A*, (DRAFT), Nicholas Nayfack, NRAD, 28 February 1992
- ASWTD A DTC II Version 2.1 User's Guide*, (DRAFT), NUWC, 28 February 1992